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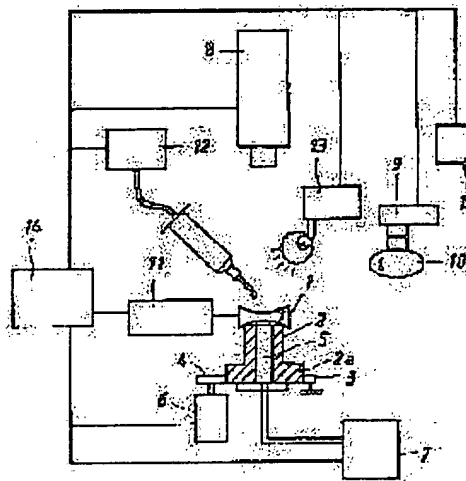
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## (54) CEMENTING DEVICE OF LENS

### (57)Abstract:

PURPOSE: To provide a cementing device of lens, with which lens holders can easily be exchanged so as to automatically exchange the lens holder in response to the outer diameter and curvature of lens to be cemented in order to cement various lenses.

CONSTITUTION: Against the outer peripheral surface of the large diameter part 2a of a lens holder 2, two driven rollers 3 and one driving roller 4 are abutted. The two driven rollers 3 and the one driving roller 4 are arranged at the positions corresponding to the apices of a regular triangle. All the outer diameters at the large diameter part of all the lens holders are set to be equal to one another. A lens holder carrying device 15 holding the lens holder 2 thereon reciprocates between the positions of a lens holder housing and of the two driven rollers 3.



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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] this invention relates to the lens junction equipment which is automatic and performs junction of the lens in optical assembly.

[0002]

[Description of the Prior Art] It may be used in optical system, joining two sheets or three lenses or more. In the junction work of this lens, in order to secure the optical performance of the stuck lens, to make the optical axis of each lens in agreement, and to join is demanded. When doing this centering junction work manually, various proposals which need advanced skill, and automate this work since working capacity is also bad are made. As conventional automatic junction centering equipment, it is proposed, for example in Japanese Patent Application No. No. 82844 [ two to ]. Opposite arrangement of the lens holder which holds two lenses joined to this equipment, respectively is carried out on the same axis up and down. The move mechanism for evacuating an upper lens holder from the above-mentioned axis to an upper lens holder, and moving up and down is attached in a series. Moreover, the rolling mechanism for rotating a lower lens holder focusing on the above-mentioned axis is attached in a series. Furthermore, the centering means, adhesives application means, and adhesive setting means of a lens are established.

[0003] The centering of the lens (lower lens) held to the lower lens holder when the above-mentioned equipment performed lens junction is performed, adhesives are applied to a lower lens, after joining the lens (upper lens) held to the upper lens holder to a lower lens, it is automatic and a series of processes of evacuating an upper lens holder, performing the centering of an upper lens, and performing temporary hardening of adhesives are performed. And in joining a remarkably different lens from the outer diameter of the lens performed to last time, it is exchanging for the vertical lens holder which suits a cemented lens manually.

[0004]

[Problem(s) to be Solved by the Invention] However, if it was in the above-mentioned equipment, when a vertical lens holder was exchanged, it needed to adjust each time and was not suitable for performing lens junction of other forms continuously by uninhabited so that the physical relationship between vertical lens holders might serve as the same axle. moreover, \*\* which it is automatic and are exchanged while the rolling mechanism is attached in the lower lens holder, the adjustment which makes in agreement this center of rotation and the center of a lens holder is required and exchange takes time -- it was difficult

[0005] this invention was made in view of the trouble of the conventional technology, makes a lens holder exchangeable structure easily, and aims at offering the lens junction equipment which can join continuously the lens of varieties with which the outer diameter of a lens and a curved surface differ from irregularity by being automatic and exchanging lens holders.

[0006]

[Means for Solving the Problem] In order to attain the above-mentioned purpose, as shown to the lens

junction equipment of this invention in the conceptual diagram of drawing 1, the lens holder 2 holding the lower lens 1 is held free [ rotation ] with the passive roller 3 and the active roller 4. the adsorption for a lens holder 2 adsorbing the lower lens 1 -- the hole 5 is formed in the center Lower 2a of a lens holder 2 is formed in a major diameter, shows the passive roller 3 and the active roller 4 to spite the periphery side of this lower 2a, rotates the motor 6 connected with the active roller 4, and rotates a lens holder 2. The attaching part of lower 2a and the lower lens 1 is processed so that it may become the same axle. This lens holder 2 is formed free [ attachment and detachment ] easily, without being concluded by other parts in order to hold and rotate only with the active roller 3 and the passive roller 4. And a lens holder 2 is conveyed by the lens-holder transport device 15 in the above-mentioned position. adsorption of a lens holder 2 -- the lens adsorber 7 which carries out adsorption maintenance of the lower lens 1 is connected to the hole 5 An eccentric measurement means 8 to measure the eccentricity of the lower lens 1 on the axis of rotation of a lens holder 2 can be arranged, and it can ask now for the position of the center of curvature of the lower lens 1 above a lens holder 2 using reflection of the lower lens 1. Moreover, it carries in on the axis of rotation of a lens holder 2, and the lens transport device 9 which can evacuate from the axis of rotation freely is arranged above the lens holder 2. If shown in drawing, the upper lens 10 joined to the lower lens 1 is held. The periphery side of the lower lens 1 held by the lens holder 2 is countered, and centering equipment 11 is arranged. The centering of it is carried out centering equipment 11 pushing the side of the lower lens 1, and changing a position on a lens holder 2, and it is formed free [ vertical movement ] so that the centering of the upper lens 10 joined on the lower lens 1 can be performed. Furthermore, the adhesives coater 12 which applies adhesives in the position which does not bar the optical path of the eccentric measurement means 8 above [ on a lens holder 2 ] at the lower lens 1, and the black light 13 which hardens the applied adhesives are arranged. And it connects with a control unit 14, respectively, and the above-mentioned motor 6, the lens adsorber 7, the eccentric measurement means 8, the lens transport device 9, centering equipment 11, the adhesives coater 12, and the black light 13 are controlling the above-mentioned equipment etc. Drawing 2 is the cross section showing \*\*\*\*\* which joined the lower lens 1 and the upper lens 10 by the lens holder 2.

[0007]

[Function] If it is in the lens junction equipment constituted as mentioned above, by instructions of a control unit 13, the lens transport device 9 holds the lower lens 1, and conveys it on a lens holder 2, and an adsorber 7 carries out adsorption maintenance of the lower lens 1 on a lens holder 2. The passive roller 3 and the active roller 4 hold a lens holder 2, and the active roller 4 rotates a lens holder 2. Since the lens contact side of a lens holder 2 and the field of lower 2a of a lens holder 2 are processed into the same axle at this time, the center of curvature of the inferior surface of tongue of the lower lens 1 becomes an axis-of-rotation top. The eccentric measurement means 8 measures the eccentricity to the axis of rotation of the center of curvature of the upper surface of the lower lens 1 in this state. Centering equipment 11 is pushed from the periphery side of the lower lens 1, when the lens holder 2 has stopped so that it may be in agreement in the center of curvature and the axis of rotation of a lower lens on top, and it moves and carries out the centering of the lower lens 1. And when a lens holder 2 is rotated, a centering state is checked again and the centering is not performed for the check, the above-mentioned centering work is repeated. Although the electrode holder 2 is adsorbed on the lower lens 1 at this time, in order to slide on the lower lens 1 on a lens holder 2, influence does not have it in centering work. Next, the adhesives coater 12 carries out the optimum dose application of the ultraviolet-rays hardening type adhesives on the lower lens 1. Then, contacting the upper lens 10 on the lower lens 1 which applied adhesives by the lens transport device 9 slowly, joining it to it, and rotating a lens holder 2 with the active roller 4, the center of curvature of the upper surface of the upper lens 10 and the eccentricity to the axis of rotation are measured using the eccentric measurement means 8, with centering equipment 11, the side of the upper lens 10 is pushed and a centering is carried out so that center of curvature may come to the center of rotation. At this time, since the lens holder 2 is adsorbed with the lens adsorber 7, the lower lens 1 does not move, but only the upper lens 10 resists and moves it to the viscosity of adhesives. Where the centering of the upper lens 10 is completed, ultraviolet rays are irradiated by the

black light 13 at a plane of composition, and temporary hardening of the adhesives is carried out. Thereby, the center of curvature of two lenses 1 and 10 is located in a line on the center of rotation of a lens holder 2, and after the optical axis of each lenses 1 and 10 has been in agreement, it is joined. It is possible to do the centering junction work of three or more lenses by repeating the same procedure hereafter.

[0008]

[Example 1] Drawing 3 is the perspective diagram showing the example 1 of the lens junction equipment concerning this invention. Two rails 21 have a necessary interval to the lens junction equipment 20 of this example, and are prepared in it in parallel and horizontally. While the move board 23 is \*\*\*\*(ed) and being prepared free [ movement to the longitudinal direction of a rail 21 ] on two rails 21 at the move board 23, it stops with the stopper which is not illustrated in the ends of a rail 21, and a middle position and which moves, an exact position is reproduced, and it is positioned. The active roller 24 is arranged between two rails 23 so that it may be located out of the side of the move board 23 which stopped in this middle halt position.

[0009] The active roller 24 is attached at the nose of cam of the axis of rotation of a motor 25, and is formed free [ vertical movement ] with the motor 25 in the cylinder 26 attached in the soffit of a motor 25. That is, it interferes in the active roller 24 moving above the move board 23 in an elevation position, moving under the move board 23 in a processing position, and the move board 23 transporting a rail 21 top.

[0010] On the move board 23, while collaborating with the above-mentioned activity roller 24 and regulating the rotation position of a lens holder 27, two passive rollers 28 held free [ rotation of a lens holder 27 ] are arranged. It is arranged in the position used as each vertex of an equilateral triangle, two passive rollers 28 and active rollers 24 contact lower 27a of a lens holder 27, and a lens holder 27 rotates two passive rollers 28 and active rollers 24 by rotation of the active roller 24. In addition, the passive roller 28 is not restricted to two of three division into equal parts, and if it counters with the active roller 24 and it is made to receive by two places, it does not need to limit between each roller to 120 degrees. Moreover, YATOI 31 for upper lenses which lays the upper lens 30 joined to the lower lens 29 held on the lens holder 27 on the move board 23 is arranged.

[0011] The periphery side of the lower lens 29 held to the lens holder 27 can be made to face, and it is fixed on a support plate 33, and three centering equipments 32 can push the lower lens 29 from three directions, and can carry out [ lens ] a centering now above the move board 23. A support plate 33 fixes to the cylinder rod of a cylinder 34, and is prepared free [ vertical movement ] to make the periphery side of the upper lens 30 on the lower lens 29 face centering equipment 32. And in case the move board 23 moves in a rail 21 top, centering equipment 32 can be evacuated up so that it may not become the hindrance of movement. As for the above-mentioned lens holder 27, the through-hole is formed in the center while major-diameter section 27a is formed in a soffit. The lens adsorber 35 is connected to this through-hole, and it has become as [ carry out / adsorption maintenance of the lower lens 29 / on a lens holder 27 / with the lens adsorber 35 ].

[0012] Above the middle halt position of the move board 23, the eccentric measuring device 36 which measures the position of the center of curvature of the lower lens 29 on a lens holder 27 or the upper lens 30 by the reflected light from a lens side is arranged in accordance with the center-of-rotation shaft of a lens holder 27.

[0013] Near the rail 21, the lens tray 38 which contains a lens 37 (the lower lens 29 and upper lens 30), and the lens-holder tray 40 which contains various kinds of lens holders 39 are arranged. The XY robot 41 is stationed on the lens tray 38 and the lens-holder tray 40. By the lens transport device 42 carrying out adsorption maintenance of the lens 37 in the lens tray 38, the lens-holder transport device 43 can grasp the lens holder 39 in lens-holder YATOI 40, and a lens holder 39 can be conveyed [ attach / the lens transport device 42 and the lens-holder transport device 43 / in the XY robot 41 ] on the move board 23 between the passive roller 28 and active roller 24, or the upper lens 30 can be conveyed now on the lower lens 29 and lens YATOI on a lens holder 39. Furthermore, the lens-holder transport device 43 can return the lens holder 27 on the move board 23 in the lens-holder tray 40, and can return the

joined cemented lens in the lens tray 38. In addition, as for the lens holder 27 conveyed by the lens-holder transport device 43, the whole of the major-diameter section 27a is formed in the diameter of the same.

[0014] The adhesives coater 46 and the adhesion equipment 47 which were held possible [ movement ] vertically and horizontally by the motor 44 and the motor 45 at the end of one side of a rail 21 are installed. The adhesives coater 46 is for the adhesives of optimum dose being dropped at the lower lens 29 on the lens holder 27 on the move board 23 which has moved in the rail 21 top. Adhesion equipment 47 carries out adsorption maintenance through the adsorption putt 48, moves horizontally the lens 30 laid on YATOI 31 for upper lenses prepared on the move board 23, and has the function which brings the upper lens 30 close slowly and is pasted up from right above the lower lens 29. Moreover, in order to stiffen ultraviolet-rays hardening type adhesives, the black light 49 is formed in the position which does not bar the optical path of the eccentric measuring device 36 on centering equipment 32.

[0015] Next, an operation of this example is explained. In drawing 3 , upper lens 30 and the bottom lens 29 are laid in lens-holder 27 and YATOI 31 for top lenses which is on the move board 23, respectively by the XY robot's 41 lens transport device 42 in the state where the move board 23 is most in right-hand side. Next, while moving in a rail 21 top, making it stop in the place which exceeded the move board 23 more slightly than a middle halt position and making a motor 26 and the active roller 24 go up, the move board 23 is backed and positioned, the active roller 24 is shown to spite a lens holder 27, a lens holder 27 is rotated, and the eccentricity to the axis of rotation of the lower lens 29 upper surface is measured by the eccentric measuring device 36. The side of the lower lens 29 is pushed according to the height which can push the lower lens 29 for centering equipment 32 from the side, and a centering is carried out with centering equipment 32 so that the center of curvature of the upper surface of the lower lens 29 may be in agreement with the center of rotation. It draws in with the lens adsorber 35 from the through-hole of a lens holder 27 in this state, and adsorption maintenance of the lower lens 29 is carried out.

[0016] Next, the move board 23 is positioned at the end of the leftmost of drawing 3 , the optimum dose application of the adhesives is carried out by the adhesives coater 46 at the lower lens 29, with adhesion equipment 47, in the adsorption putt 48, adsorption maintenance is carried out, the upper lens 30 of YATOI 31 for upper lenses is lifted, the Gokami lens 30 which moved onto the lower lens 29 is taken down, and both the lenses 29 and 30 are pasted up. The move board 23 is again positioned in a middle halt position here, the height of centering equipment 32 is doubled with the side of the upper lens 30, a lens holder 27 is rotated and the eccentricity to the axis of rotation of the upper surface of the upper lens 30 is measured by the eccentric measuring device 36. Next, by the eccentric measuring device 36, the center of curvature of the upper surface of the upper lens 30 carries out a centering with centering equipment 32 so that it may come to the center of rotation. Ultraviolet rays are irradiated by the black light 49 in the place out of which the heart of the upper lens 30 came at a plane of composition, and adhesives are stiffened. Finally, the move board 23 is positioned most before drawing 3 , the lens which junction finished is returned to the lens YATOI tray 38 by the lens transport device 42, and junction work is finished.

[0017] When the kind of lens which it is going to join changes, the suitable thing of the lens holders 13 for which aperture is prepared in some numbers with the outer diameter of the lens is exchanged for what has appeared in the present move board 23 by the XY robot's 27 lens-holder transport device 25. under the present circumstances, it places so that major-diameter section 27a of two peripheral surfaces of the passive roller 28 and a lens holder 27 may be contacted, and with the active roller 24, position appearance is pushed and carried out and it carries out Although these operation of each is not expressed to drawing, it is controlled by the control unit. According to this example, since it corresponds to junction of the lens of the path of varieties, the lens holder of varieties is easily [ automatically and ] exchangeable.

[0018]

[Example 2] Drawing 4 is the perspective diagram showing the example 2 of the lens junction equipment concerning this invention. The upper lens 51 and the lower lens 52 are arranged in the lens junction equipment 50 of this example by the upper lens tray 53 and the lower lens tray 54, respectively.

An index table 55 is formed in the center of equipment 50 free [ rotation ], and two or more lens holders 56 from which the aperture of the portion which receives a lens 52 differed are laid in the periphery section on an index table 55. It is shown by two passive rollers 57 to spite, and the position is decided, and each lens holder 56 is positioned in the same position of the place of centering equipment 58 established in one place of a periphery, when an index table 55 rotates. The lens holder 56 positioned in the position of centering equipment 58 is rotated with the active roller 60 driven by the motor 59 which constitutes a rolling mechanism, and the motor 59, being shown by the passive roller 57 to spite. The lower lens 53 can be adsorbed with the lens adsorber 61 connected with the through-hole of the center of a lens holder 56. The upper lens 51 and the lower lens 52 are conveyed by the lens transport devices 63 and 64 attached in the both arms of the level many joint type double arm robot 62 between the lens-holder 56 tops positioned in the position of the upper lens tray 53, the lower lens tray 54, and centering equipment 58, respectively. The adhesives coater 65 for applying ultraviolet-rays hardening type adhesives to a cemented lens-ed (lower lens 52) and the black light 66 for irradiating ultraviolet rays at adhesives are installed by the upper part of centering equipment 58. Moreover, the eccentric measuring device 67 for measuring the eccentricity of the lower lens 51 and the upper lens 52 above [ on the shaft of the medial axis of the lens holder 56 positioned in the position of centering equipment 58 ] is installed.

[0019] Next, an operation of an example 2 is explained. In drawing 4 , it holds by the lens transport device 64 in which the lower lens 52 put on the lower lens tray 54 was attached by one arm of a robot 62, and carries on the lens holder 56 positioned in the position of centering equipment 58. The lower lens 52 on a lens holder 56 is adsorbed by the lens adsorber 61. It is made to rotate, showing a lens holder 56 with the activity roller 60 attached in the motor 59 to spite the passive roller 57, and the eccentricity to the axis of rotation of the upper surface of the lower lens 52 is measured by the eccentric measuring device 67. The side of the lower lens 52 is pushed from three directions with centering equipment 58, and a centering is carried out so that this eccentricity may be set to 0.

[0020] Next, the adhesives of optimum dose are applied by the adhesives coater 65 attached in the robot 62. The upper lens 51 is adsorbed by the lens transport device 63 attached in another arm of a robot 62, and from the lower lens 52 which applied adhesives, it is made to contact calmly and pastes up. The eccentricity to the axis of rotation of the upper surface of the upper lens 51 is measured with the activity roller 60 which attached the lens holder 56 in the motor 59 again. The side of the upper lens 51 is pushed from three directions with centering equipment 58, and a centering is carried out so that this eccentricity may be set to 0. After the heart has come out, ultraviolet rays are irradiated by the black light 66, and adhesives are stiffened. When the outer diameter of a cemented lens-ed joins a remarkably different lens, the centering of the lens of a wide range outer diameter can be carried out by rotating an index table 55, positioning the lens holder 56 of suitable aperture at the place of a centering mechanism, and carrying out the same operation as the above. These operation is controlled by the control unit which is not shown in drawing.

[0021] Since according to this example conveyance and junction work of lenses 51 and 52 are done only by the robot 62 compared with an example 1 and special mechanisms, such as an adhesives application, and junction, a transport device of a lens holder 56, can be excluded, a mechanism becomes easy as a whole.

[0022]

[Effect of the Invention] According to this invention, the lens of varieties is continuously joinable with one set of a machine by choosing, being automatic and exchanging the optimal thing out of two or more lens holders, according to the outer diameter and curvature of the lens to join.

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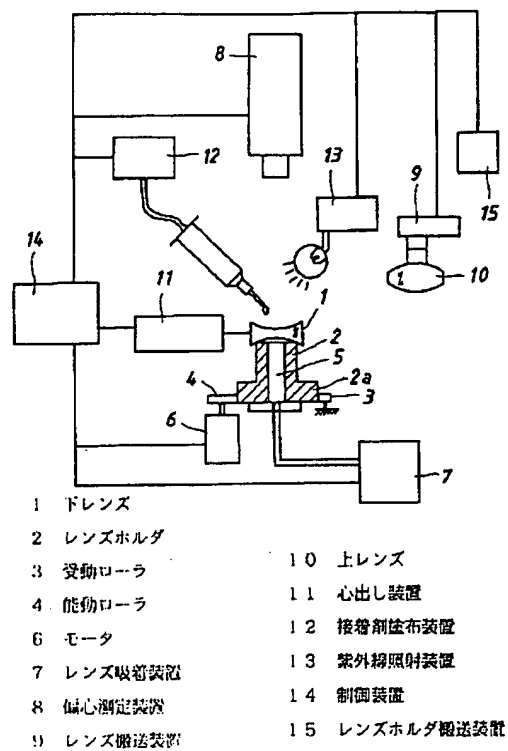
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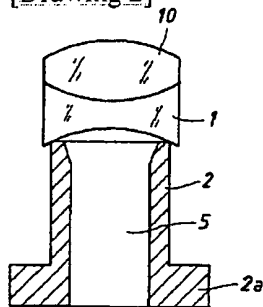
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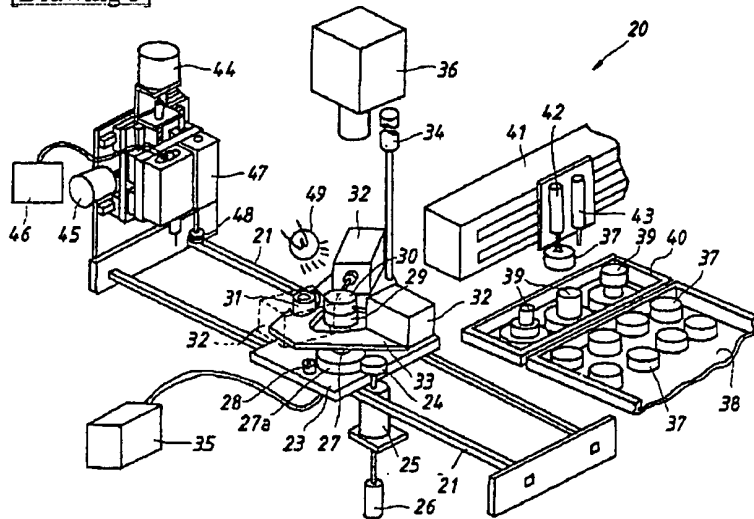
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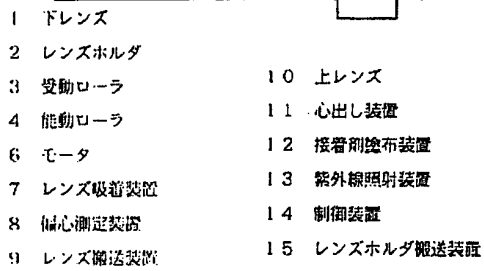
[Drawing 2]



[Drawing 3]



[Drawing 1]



[Translation done.]